

WHAT IS CLAIMED IS:

1. An exposure apparatus comprising:

an illuminating optical system for illuminating a reticle with illuminating light from a light source;

5 a projection optical system for projecting a pattern, which has been formed on the reticle, onto a photosensitive substrate; and

a position detection system for detecting an alignment mark on the substrate;

10 wherein a pattern projection region for projecting the pattern onto the substrate by said projection optical system is formed at a position that is off-centered toward the side of said position detection system from the projection center of said projection  
15 optical system.

2. The apparatus according to claim 1, wherein said apparatus is so constructed that the center of said position detection system resides on an extension of a straight line extending from the projection center of  
20 said projection optical system on the substrate to the center of the pattern projection region.

3. An exposure apparatus comprising:

a projection optical system for projecting a pattern, which has been formed on a reticle, onto a  
25 photosensitive substrate;

a substrate stage capable of holding and moving the substrate;

a substrate transport system for transporting the substrate to said substrate stage; and

a position detection system for detecting an alignment mark on the substrate;

5        wherein a projection region of the pattern, which region is formed on the substrate via said projection optical system, is formed at a position that is off-centered with respect to the projection center of said projection optical system; and

10        said substrate transport system is disposed on the side of the projection region with respect to the projection center.

4. The apparatus according to claim 3, wherein said position detection system is disposed between said  
15        substrate transport system and said projection optical system.

5. An exposure apparatus comprising:

a projection optical system for projecting a pattern, which has been formed on a reticle, onto a  
20        photosensitive substrate;

said projection optical system forming a projection region of the pattern, which region is formed on the substrate, at a position off-centered with respect to the projection center of said projection  
25        optical system; and

a plurality of position detection systems for detecting an alignment mark on the substrate;

wherein said plurality of position detection systems are disposed on the side of said projection region with respect to the projection center.

6. The apparatus according to claim 5, wherein said plurality of position detection systems are each disposed along mutually perpendicular X and Y directions passing through the center, or substantially the center, of the projection region and lying parallel to the surface of the substrate.

7. The apparatus according to claim 6, wherein position of the alignment mark along the Y direction is detected by the position detection system disposed along the X direction and position of the alignment mark along the X direction is detected by the position detection system disposed along the Y direction.

8. An exposure apparatus comprising:

a projection optical system for projecting a mask pattern onto a photosensitive substrate; and

a mask stage capable of holding and moving the mask;

a mask transport system for transporting the mask to said mask stage:

wherein a projection region of the pattern, which region is formed on the substrate via said projection optical system, is formed at a position that is off-centered with respect to the projection center of said projection optical system;

an illumination region on the mask is formed at a position that is off-centered with respect to the projection center; and

5       said mask transport system is disposed on the side of the illumination region with respect to the projection center.

9. An exposure apparatus comprising:

a projection optical system for projecting a mask pattern onto a photosensitive substrate;

10       a mask stage capable of holding and moving the mask;

a mask transport system for transporting the mask to said mask stage; and

15       a substrate stage capable of holding and moving the substrate;

a substrate transport system for transporting the substrate to said substrate stage; and

a position detection system for detecting an alignment mark on the substrate;

20       wherein a projection region of the pattern, which region is formed on the substrate via said projection optical system, and an illumination region on the mask are formed at positions that off-centered to the same side with respect to the projection center of said  
25       projection optical system; and

      said mask transport system and said substrate transport system are disposed on the side of the

projection region and illumination region with respect to the projection center.

10. The apparatus according to claim 1, wherein said projection optical system forms an intermediate image  
5 within said projection optical system.

11. The apparatus according to claim 3, wherein said projection optical system forms an intermediate image within said projection optical system.

12. The apparatus according to claim 5, wherein said  
10 projection optical system forms an intermediate image within said projection optical system.

13. The apparatus according to claim 8, wherein said projection optical system forms an intermediate image within said projection optical system.

14. The apparatus according to claim 9, wherein said  
15 projection optical system forms an intermediate image within said projection optical system.

15. The apparatus according to claim 9, wherein said position detection system is disposed on the side of the  
20 projection region and illumination region with respect to the projection center.

16. The apparatus according to claim 9, further comprising a mask position detection system for positioning the mask;

25 wherein said mask position detection system is disposed on the side of the projection region and

illumination region with respect to the projection center.

17. The apparatus according to claim 1, wherein said projection optical system is a reflection projection  
5 optical system.

18. The apparatus according to claim 3, wherein said projection optical system is a reflection projection optical system.

19. The apparatus according to claim 5, wherein said  
10 projection optical system is a reflection projection optical system.

20. The apparatus according to claim 8, wherein said projection optical system is a reflection projection optical system.

21. The apparatus according to claim 9, wherein said  
15 projection optical system is a reflection projection optical system.

22. The apparatus according to claim 1, wherein said projection optical system is a reflection-refraction  
20 optical system.

23. The apparatus according to claim 3, wherein said projection optical system is a reflection-refraction optical system.

24. The apparatus according to claim 5, wherein said  
25 projection optical system is a reflection-refraction optical system.

25. The apparatus according to claim 8, wherein said projection optical system is a reflection-refraction optical system.

26. The apparatus according to claim 9, wherein said  
5 projection optical system is a reflection-refraction optical system.

27. The apparatus according to claim 1, wherein said exposure apparatus is a scanning-type exposure apparatus.

10 28. The apparatus according to claim 3, wherein said exposure apparatus is a scanning-type exposure apparatus.

29. The apparatus according to claim 5, wherein said exposure apparatus is a scanning-type exposure  
15 apparatus.

30. The apparatus according to claim 8, wherein said exposure apparatus is a scanning-type exposure apparatus.

31. The apparatus according to claim 9, wherein said  
20 exposure apparatus is a scanning-type exposure apparatus.

32. A method of manufacturing a device by the exposure apparatus set forth in claim 1.

33. A method of manufacturing a semiconductor device,  
25 comprising the steps of:

placing a group of manufacturing equipment for various processes, inclusive of the exposure apparatus

set forth in claim 1, in a plant for manufacturing semiconductor devices; and

manufacturing a semiconductor device by a plurality of processes using this group of manufacturing equipment.

34. The method according to claim 33, further comprising the steps of:

interconnecting the group of manufacturing equipment by a local-area network; and  
communicating, by data communication, information relating to at least said exposure apparatus in said group of manufacturing equipment between the local-area network and an external network outside said plant.

35. The method according to claim 34, wherein maintenance information for said manufacturing equipment is obtained by accessing, by data communication via the external network, a database provided by a vendor or user of said exposure apparatus, or production management is performed by data communication with a semiconductor manufacturing plant other than said first-mentioned semiconductor manufacturing plant via the external network.

36. A semiconductor manufacturing plant, comprising:  
a group of manufacturing equipment for various processes, inclusive of an exposure apparatus set forth in claim 1;

a local-area network for interconnecting the group



of manufacturing equipment; and

a gateway for making it possible to access, from said local-area network, an external network outside the plant;

5           whereby information relating to at least one of the pieces of manufacturing equipment can be communicated by data communication.

37. A method of maintaining an exposure apparatus, which is set forth in claim 1, installed in a semiconductor manufacturing plant, comprising the steps of:

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providing a maintenance database, which is connected to an external network of the semiconductor manufacturing plant, by a vendor or user of said exposure apparatus;

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allowing access to said maintenance database from within the semiconductor manufacturing plant via said external network; and

transmitting maintenance information, which is stored in said maintenance database, to the side of the semiconductor manufacturing plant via said external network.

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38. The exposure apparatus according to claim 1, further comprising:

25           a display;  
            a network interface; and  
            a computer for running network software;

wherein maintenance information relating to said exposure apparatus is communicated by data communication via a computer network.

39. The apparatus according to claim 38, wherein the  
5 network software provides said display with a user interface for accessing a maintenance database, which is connected to an external network of a plant at which said exposure apparatus has been installed, and which is provided by a vendor or user of the exposure apparatus,  
10 thereby obtaining information from said database via said external network.

40. A position detector used in an exposure apparatus for irradiating a reticle with exposing light from a light source by an illuminating optical system, and  
15 projecting a pattern, which has been formed on the reticle, onto a photosensitive substrate by a projection optical system at a position that is off-centered from a projection center of said projection optical system, said position detector having a sensor for sensing an  
20 alignment mark on the substrate;

wherein said sensor is disposed on a side, relative to the projection center of said projection optical system, on which a pattern projection region on the substrate resides.